

Public Protection Classification Summary Report



Amherst Massachusetts



Public Protection Classification (PPC™) Program

PUBLIC PROTECTION SUMMARY REPORT

Amherst

Massachusetts

Prepared by

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Background Information

Introduction

ISO collects and evaluates information from communities in the United States on their structure fire suppression capabilities. We analyze the data using our Fire Suppression Rating Schedule (FSRS™) and then assign a Public Protection Classification (PPC™) number to the community. The surveys are conducted whenever it appears that there is a possibility of a classification change. As such, the PPC program provides important, up-to-date information about fire protection services throughout the country.

A community's investment in fire mitigation is a proven and reliable predictor of future fire losses. Statistical data on insurance losses bears out the relationship between excellent fire protection – as measured by the PPC program – and low fire losses. So, insurance companies use PPC information for marketing, underwriting, and to help establish fair premiums for homeowners and commercial fire insurance. In general, the price of fire insurance in a community with a good PPC is substantially lower than in a community with a poor PPC, assuming all other factors are equal.

ISO is an independent company that serves insurance companies, communities, fire departments, insurance regulators, and others by providing information about risk. ISO's expert staff collects information about municipal fire suppression efforts in communities throughout the United States. In each of those communities, ISO analyzes the relevant data and assigns a Public Protection Classification – a number from 1 to 10. Class 1 represents an exemplary fire suppression program, and Class 10 indicates that the area's fire suppression program does not meet ISO's minimum criteria.

ISO's PPC program evaluates communities according to a uniform set of criteria, incorporating nationally recognized standards developed by the National Fire Protection Association and the American Water Works Association. A community's PPC depends on:

- **Fire alarm and communication systems**, including telephone systems, telephone lines, staffing, and dispatching systems
- **The fire department**, including equipment, staffing, training, and geographic distribution of fire companies
- **The water supply system**, including condition and maintenance of hydrants, alternative water supply operations, and a careful evaluation of the amount of available water compared with the amount needed to suppress fires up to 3,500 gpm.

Data Collection and Analysis

ISO has evaluated and classified over 44,000 fire protection areas across the United States using its Fire Suppression Rating Schedule (FSRS). We use a combination of a meeting between a trained ISO field representative and the dispatch center coordinator, community fire official, and water superintendent in conjunction with a comprehensive questionnaire to collect the data necessary to determine the PPC number. In order for a community to obtain a classification better than a Class 9, three elements of fire suppression features are reviewed. These three elements are the fire alarm and communication system, the fire department and the water supply system.

A review of the **fire alarm and communication system** accounts for 10% of the total classification. The review focuses on the community's facilities and support for handling and dispatching fire alarms. This section is weighted at **10 points** broken up as follows:

- Telephone Service 2 points
- Number of Needed Operators 3 points
- Dispatch Circuits 5 points

A review of the **fire department** accounts for 50% of the total classification. ISO focuses on a fire department's first-alarm response and initial attack to minimize potential loss. In this section, ISO reviews such items as engine companies, ladder or service companies, distribution of fire stations and fire companies, equipment carried on apparatus, pumping capacity, reserve apparatus, department personnel, and training. The fire department section is weighted at **50 points** distributed as follows:

- Engine Companies 10 points
- Reserve Pumpers 1 point
- Pumper Capacity 5 points
- Ladder/Service Companies 5 points
- Reserve Ladder/Service Trucks 1 point
- Distribution of Companies 4 points
- Company Personnel 15 points
- Training 9 points

A review of the **water supply system** accounts for 40% of the total classification. ISO reviews the water supply a community uses to determine the adequacy for fire-suppression purposes. We also consider hydrant size, type, and installation, as well as the inspection frequency and condition of fire hydrants. The water supply system is weighted at **40 points** with concern for the following:

- Credit for the Supply System 35 points
- Hydrant Size, Type & Installation 2 points
- Inspection/Condition of Hydrants 3 points

There is one additional factor considered in calculating the final score – **Divergence**.

Even the best fire department will be less than fully effective if it has an inadequate water supply. Similarly, even a superior water supply will be less than fully effective if the fire department lacks the equipment or personnel to use the water. The preliminary FSRS score is subject to modification by a divergence factor, which recognizes disparity between the effectiveness of the fire department and the water supply.

The Divergence factor mathematically reduces your preliminary scores if the fire department and water-supply scores are out of line with each other. The factor is introduced in the final equation.

Public Protection Classification Number

The PPC number assigned to the community will depend on the community's score on a 100-point scale:

PPC	Points
1	90.00 or more
2	80.00 to 89.99
3	70.00 to 79.99
4	60.00 to 69.99
5	50.00 to 59.99
6	40.00 to 49.99
7	30.00 to 39.99
8	20.00 to 29.99
9	10.00 to 19.99
10	0.00 to 9.99

The classification numbers are interpreted as follows:

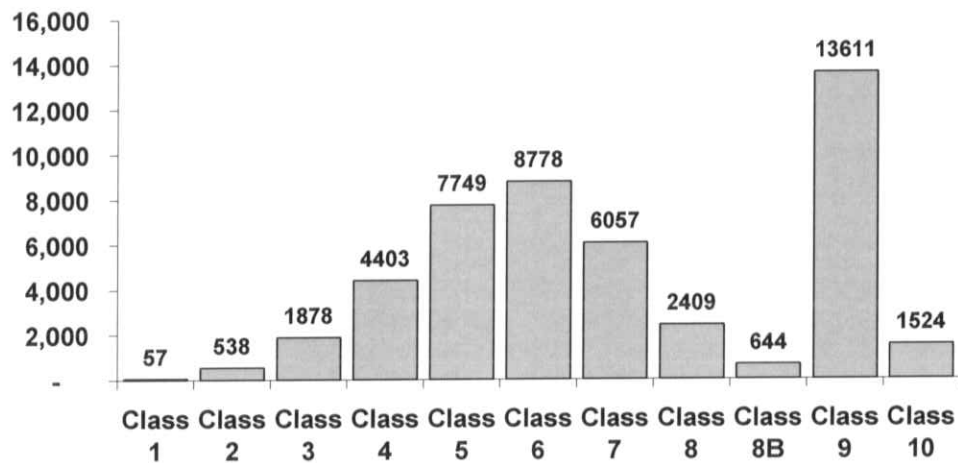
- Class 1 through (and including) Class 8 represents a fire suppression system that includes an FSRS creditable dispatch center, fire department and water supply.
- Class 8B is a special classification that recognizes a superior level of fire protection in otherwise Class 9 areas. It is designed to represent a fire protection delivery system that is superior except for a lack of a water supply system capable of the minimum FSRS fire flow criteria of 250 gpm for 2-hours.
- Class 9 is a fire suppression system that includes a creditable dispatch center, fire department but no FSRS creditable water supply.
- Class 10 does not meet minimum FSRS criteria for recognition.

ISO develops a single Public Protection Classification for a community when 85% or more of the buildable area is served by a water supply capable of delivering 250 gpm of fire flow, uninterrupted, for a minimum period of 2-hours, and there are no areas beyond 5 road miles of the responding fire station. Under this condition, all of the structures in the community receive that classification. Over 60% of the communities ISO has evaluated do not have this capability, so ISO develops a split classification (for example, 5/9). When a split classification is published the first class (Class 5 in the example) applies to properties within 5 road miles of a recognized fire station and within 1,000 feet of a fire hydrant. The second class (Class 9 in the example) applies to properties within 5 road miles of a recognized fire station but beyond 1,000 feet of a hydrant. ISO generally assigns Class 10 to properties beyond 5 road miles.

Distribution of Public Protection Classification Numbers

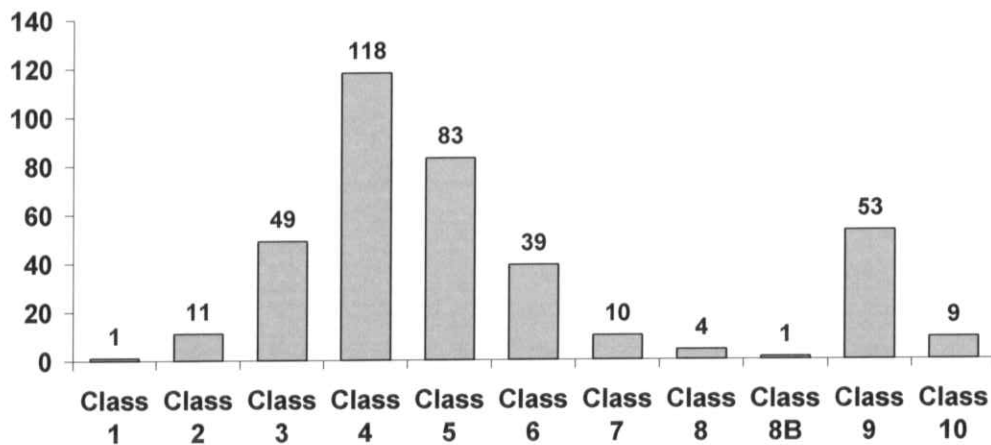
The 2008 published countrywide distribution of communities by the Public Protection Classification number is as follows:

Countrywide



The 2008 published distribution of communities by the Public Protection Classification number is as follows:

MASSACHUSETTS



Assistance

The PPC program offers help to communities, fire departments and other public officials as they plan for, budget, and justify improvements. ISO is also available to assist in the understanding of the details of your evaluation.

ISO Public Protection representatives can be reached by telephone at (800) 444-4554. The technical specialists at this telephone number have access to the details of your evaluation and can effectively speak with you about your PPC questions. What's more, we can be reached via the internet at www.isomitigation.com/talk/.

We also have a website that is dedicated to our Community Mitigation Classification programs at www.isomitigation.com. Here, fire chiefs, building code officials, community leaders and other interested citizens can access a wealth of data describing the criteria used in evaluating how cities and towns are protecting residents from fire and other natural hazards. This website will allow you to learn more about ISO's Public Protection Classification program. The website provides important background information and insights about the PPC grading processes. Visitors to the site can download information, see statistical results and also contact ISO for assistance.

In addition, on-line access to the Fire Suppression Rating Schedule and its commentaries is available to registered customers for a fee. However, fire chiefs and community chief administrative officials are given access privileges to this information without charge.

To become a registered fire chief or community chief administrative official, send your request on fire department or chief administrative official's letterhead to:

ISO
Customer Service
545 Washington Boulevard
Jersey City, NJ 07310-1686

Be sure to include your name and title, address, daytime phone number and e-mail address. ISO will send you an e-mail containing your ID and password.

Classification Details

Public Protection Classification

On May 07, 2009 ISO concluded its review of the fire suppression features being provided for/by Amherst. The resulting classification is a **Class 4/9**.

If the classification is a single class, the classification applies to all properties in the community. If the classification is a "split" class (e.g., 6/9), the following applies:

- The first class (e.g., "6" in a 6/9) applies to properties within 5-road miles of a recognized fire station and within 1,000 feet of a fire hydrant or alternate water supply.
- Class 8B or class 9 applies to properties beyond 1,000 feet of a fire hydrant but within 5-road miles of a recognized fire station.
- Alternative Water Supply: The first class (e.g., "6" in a 6/10) applies to all properties within 5-road miles of a recognized fire station with no hydrant distance requirement.
- Class 10 applies to properties over 5-road miles of a recognized fire station.

Summary Evaluation Analysis

The following points represent the analysis of the application of the criterion outlined in the FSRS of four topics– Receiving and Handling Fire Alarms, Fire Department, Water Supply and the Divergence factor for Amherst:

FSRS Feature	Earned Credit	Credit Available
Receiving and Handling Fire Alarms		
414. Credit for Telephone Service	1.90	2
422. Credit for Operators	1.83	3
432. Credit for Dispatch Circuits	1.50	5
440. Credit for Receiving and Handling Fire Alarms	5.23	10
Fire Department		
513. Credit for Engine Companies	8.98	10
523. Credit for Reserve Pumpers	0.90	1
532. Credit for Pumper Capacity	5.00	5
549. Credit for Ladder Service	3.10	5
553. Credit for Reserve Ladder and Service Trucks	0.17	1
561. Credit for Distribution	1.54	4
571. Credit for Company Personnel	5.67	15
580. Credit for Training	2.52	9
590. Credit for Fire Department	27.88	50
Water Supply		
616. Credit for Supply System	33.15	35
621. Credit for Hydrants	1.96	2
631. Credit for Inspection and Condition	1.08	3
640. Credit for Water Supply	36.19	40
Divergence		
700: Divergence	-6.94	--
Total Credit	62.36	100.00

General Information

To determine the Total Credit, the points for Receiving and Handling Fire Alarms, Fire Department and Water Supply are added together and the Divergence factor is applied. To establish the points for each category, FSRs items labeled as "Credit for..." are totaled. These particular items are intermediate values. Often these intermediate values are based upon a 100-point scale, but they can be more (e.g., 654 for Item 513, "Credit for Engine Companies"). The ratios between the actual points scored in each of these subsections and 100 (or, as in Item 513, other scale number) are then multiplied by the points available for the subsection.

For instance, Item 414 "Credit for Telephone Service" is valued at 2-points. To determine the credit earned, the totals for Item 411 "Review of Telephone Lines" (TL), Item 412 "Review of Telephone Directory" (TD), and Item 413 "Review of Recording Device" (RD) are summed. In Item 411, up to 60-points can accrue; Item 412 has a combined value of 20-points; and 20-points are available for Item 413. The sum of these three Items is divided by 100 and then multiplied by the 2-point weight in Item 414 to determine the final score for "Credit for Telephone Service (CTS)".

The formula for Item 414 "Credit for Telephone Service (CTS)" looks like this:

$$CTS = \frac{TS}{100} \times 2$$

Where $TS = TL + TD + RD$

Detailed Evaluation Analysis

On the following pages are the scoring details of each category of the evaluation of Amherst. These details relate only to the fire insurance classification of your jurisdiction. They are not for property loss prevention or life safety purposes and no life safety or property loss recommendations are made.

At the end of the scoring details for Receiving and Handling Fire Alarms, Fire Department, and Water Supply the relative class is indicated. The relative class represents the classification each category would have achieved if the individual score was translated into a 100-point scale instead of the points available for that category.

Receiving and Handling of Fire Alarms

Ten percent of a community's overall score is based on how well the communications center receives and dispatches fire alarms. Our field representative evaluated:

- the telephone service, including the number of telephone lines coming into the center
- the listing of the emergency number and business number in the telephone directory
- the automatic recording of emergency calls
- the communications center, including the number of operators on duty and awake at the center
- the dispatch circuits and how the center notifies firefighters about the location of the emergency

Item 414 - Credit for Telephone Service

The first item reviewed is Item 414 "Credit for Telephone Service". This item reviews the facilities provided for the public to report fires including the telephone line used to report an emergency, business and private alarm lines including progression of emergency calls to business lines. Also analyzed is the listing of fire and business numbers in the telephone directory and the automatic recording of emergency calls. ISO uses National Fire Protection Association (NFPA) 1221, *Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems* as the reference for this section.

To determine the score for Item 414, three sub-items (Item 411, Item 412, and Item 413) needed to be evaluated. The details are as follows:

Item 411 - "Review of Telephone Lines (TL)"	Earned Credit	Credit Available
<p>A. Number of needed fire lines*</p> <p>For maximum credit, there should be 4 incoming telephone lines reserved for receiving notification of fires. The Communication Center serving Amherst has 6 lines reserved.</p> <p>The telephone directory listed both a business and an emergency number.</p>	25.00	25
<p>B. Number of needed fire, business, and private alarm lines*</p> <p>For maximum credit, there should be 4 incoming lines reserved for notification of fires (and other emergency calls) plus 2 additional lines for conducting other fire department business and, if applicable, for private alarms.</p> <p>The Communication Center serving Amherst has 3 lines in addition to the 6 lines reserved for receiving notification of fires (and other emergency calls).</p> <p>The telephone directory listed both a business and an emergency number.</p>	25.00	25
<p>C. Progression of emergency calls to business lines</p> <p>For maximum credit, unanswered emergency calls should progress to the business number.</p>	10.00	10
<p>D. If detailed information of a fire is received and transmitted through more than one communication center, DEDUCT</p> <p>For maximum credit, fire calls should be immediately transferred from the answering point to the dispatcher who will then obtain the needed information from the caller for dispatching.</p>	0.00	-20
Review of Telephone Lines (TL) total:	60.00	60

*Note: When only one telephone number is listed in the telephone directory the telephone lines provided can not be reserved for emergency calls because the general public is not given a choice of telephone lines to use. Therefore, the operator/telecommunicator must accept both emergency and business calls over the same lines. The number of needed fire, business, and alarm lines will show a reduction in credit.

Item 412 - "Review of Telephone Directory (TD)"	Earned Credit	Credit Available
A. Emergency number on the inside front cover or the front page For maximum credit, the fire emergency telephone number should be printed on the inside front cover or front page of the white pages in the telephone directory.	10	10
B. Emergency number and business number listed under "Fire Department" For credit, both the number to report a fire and the fire department business number should be listed under "FIRE DEPARTMENT" in the white pages (or government section) of the telephone directory. The fire number is not listed and the business number is listed.	0	5
C. Emergency number and business number listed under the name of the city For credit, both the number to report a fire and the fire department business number should be listed under the community or fire district in the white pages (or government section) of the telephone directory. The fire number is listed and the business number is listed.	5	5
D. If the numbers for individual fire stations are listed, DEDUCT For no deduction of points, the individual fire stations should not be listed in the telephone directory.	0	-10
Review of Directory Listing (TD) total:	15	20

Item 413 - "Review of Recording Device (RD)"	Earned Credit	Credit Available
A. Review of the recording device (RD): For credit, a voice recorder should automatically record all emergency calls and the operator should be able to immediately play back any emergency call to review the conversation.	20	20
Review of Recording Device (RD) total:	20	20

The Items "TL", "TD", and "RD" are then added together and divided by the total possible points (100 points) to determine the factor that is applied to the two points available for the "Credit for Telephone Service (CTS)". The points calculated for Amherst for this item are:

CTS = 1.90 points

Item 422 - Credit for Operators

The second item reviewed is Item 422 "Credit for Operators (CTO)". This item reviews the number of operators on duty and awake at the center to handle fire calls and other emergencies. All emergency calls including those calls that do not require fire department action are reviewed to determine the proper staffing to answer emergency calls and dispatch the appropriate emergency response. NFPA 1221, *Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems*, recommends that ninety-five percent of emergency calls shall be answered within 15 seconds and ninety-nine percent of emergency calls shall be answered within 40 seconds. In addition, NFPA recommends that ninety-five percent of emergency calls shall be dispatched within 60 seconds and ninety-nine percent of calls shall be dispatched within 90 seconds of answering the call.

To receive full credit for operators on duty, ISO must review documentation to show that your communication center meets NFPA 1221 call answering and dispatch time performance measurement standards. This documentation may be in the form of performance statistics or other performance measurements compiled by the 9-1-1 software or other software programs that you are currently using such as Computer Aided Dispatch (CAD) or Management Information System (MIS). If the necessary data is not available, the number of needed operators will be determined by specification criteria using a "Call Volume Matrix Table" (see the following page).

CALL VOLUME MATRIX TABLE #1
For Public Safety Answering Points that
Perform Call Taking and Dispatching

Alarms per Year	Number of Needed Telecommunicators
Less than 731	1*
731 to 10,000	2
10,001 to 25,000	4**
25,001 to 50,000	5**
50,001 to 100,000	6**
100,001 to 150,000	7**
150,001 to 200,000	8**
200,001 to 250,000	9**
250,001 to 300,000	10**
Over 300,000***	11**

CALL VOLUME MATRIX TABLE #2
For Public Safety Answering Points that
Perform Call Taking Without Dispatching

Alarms per Year	Number of Needed Telecommunicators
Less than 10,001	1
10,001 to 50,000	2
50,001 to 100,000	4**
100,001 to 150,000	5**
150,001 to 200,000	6**
200,001 to 250,000	7**
250,001 to 300,000	8**
Over 300,000***	9**

* *Communication centers that provide emergency medical dispatching (EMD) protocols need two telecommunicators on duty at all times.*

** *Includes a supervisor in the communication center.*

*** *For every 10 additional calls (alarms) that are averaged per hour (87,600 calls per year), one additional telecommunicator is added.*

To determine the score for Item 422, two sub-Items (421.A and 421.B) need to be summed. The details are as follows:

Item 421 - "Review of Operators (PO)"	Earned Credit	Credit Available
A. Number of operators on duty (OD): For maximum credit, there should be 4 operators on duty at all times. There are an average of 2.43 operators on duty at the communication center.	48.60	80
B. Number of operators awake at all times (OA): For maximum credit, all operators should be awake at all times. There is an average of 2.43 operators awake at all times.	12.15	20
Review of Operators (PO) total:	60.75	100

After the items "OD" and "OA" are summed up to determine the points received for the "Review of Operators", the sum is divided by the total possible points (100 points) to determine the factor that is applied to the three points available for the "Credit for Operators (CTO)". The points calculated for Amherst for this item are:

CTO = 1.83 points

Item 432 - Credit for Dispatch Circuits

The third item reviewed is Item 432 "Credit for Dispatch Circuits (CDC)". This item reviews the dispatch circuit facilities used to transmit alarms to fire department members. A "Dispatch Circuit" is defined in NFPA 1221 as "A circuit over which an alarm is retransmitted automatically or manually from the communication center to an emergency response facility" (fire station or fire department member). All fire departments (except single fire station departments with full-time firefighter personnel receiving alarms directly at the fire station) need adequate means of notifying all firefighter personnel of the location of reported structure fires. The dispatch circuit facilities should be in accordance with the general criteria of NFPA 1221. "Alarms" are defined in this Standard as "A signal or message from a person or device indicating the existence of a fire, medical emergency or other situation that requires fire department action".

There are two different levels of dispatch circuit facilities provided for in the Standard – a primary dispatch circuit and a secondary dispatch circuit. In jurisdictions that receive over 730 alarms or more per year (average of two alarms per 24-hour period), two separate and dedicated dispatch circuits, a primary and a secondary, are needed. In jurisdictions receiving fewer than 730 alarms per year, a second dedicated dispatch circuit is not needed. Dispatch circuit facilities installed but not used or tested (in accordance with the NFPA Standard) receive no credit.

Your score for Credit for Dispatch Circuits (CDC) is influenced by monitoring the integrity of the primary dispatch circuit. There are up to 1.5 points available for this Item. Monitoring for integrity involves installing automatic systems that will detect faults and failures and send visual and audible indications to appropriate communications center (or dispatch center) personnel. ISO uses NFPA 1221 to guide the evaluation of this item.

Additional points are available for dispatch recording facilities at the Communication Center. All alarms that are transmitted over the required dispatch circuits need to be automatically recorded (including the dates and times of transmission) to earn the maximum points in this item.

ISO's evaluation includes a review of the communication system's emergency power supplies. To receive maximum credit, two sources of power need to be provided for the operation of the communications network including dispatch circuits and its related support systems and equipment. A common arrangement is to have the primary power come from a utility distribution system and a secondary power source from an automatic starting emergency engine-generator and/or an Uninterruptible Power Supply (UPS) and Battery System – (SEPSS-Stored Emergency Power Supply Systems).

To determine the score for Item 432, four sub items (Item 431.A, Item 431.B, Item 431.C and Item 431.D) needed to be evaluated. The criterion is as follows:

The score that Amherst received for Item 432 was calculated as follows:

Item 432 - "Credit for Dispatch Circuits (CDC)"	Earned Credit	Credit Available
Item 431A - "Dispatch Circuits Provided" The points are determined by prorating the value of the type of dispatch circuit using the percentage of members dependent upon each circuit.	20.00	40
Item 431B - "Monitoring for Integrity of Circuit" For maximum credit, the dispatch circuit should have an automatic system that will detect faults and failures and send visual and audible indications to appropriate personnel.	0.00	30
Item 431C - "Dispatch Recording Facilities at Communication Center" For maximum credit, all alarms that are transmitted over the required dispatch circuits need to be automatically recorded.	5.00	10
Item 431D - "Emergency Power Supply" For maximum credit, emergency power supplies need to be provided and regularly tested.	5.00	20
Item 431E - "When no circuit is needed" If all responding fire fighters are in the same building as the communication center and are alerted, no dispatch circuit is needed and the maximum points are credited. However, the community does not operate in this fashion.	0.00	100
Dispatch Circuits (DC) total:	30.00	100

After the Items in 431 are summed up to determine the points received for the "Credit for Dispatch Circuits", the sum is divided by the total possible points (100 points) to determine the factor that is applied to the five points available for the "Credit for Dispatch Circuits (CDC)". The points calculated for Amherst for this item are:

CDC = 1.50 points

The final step in determining the credit for "Receiving and Handling Fire Alarms" is to add up the following three components:

Item	Earned Credit	Credit Available
414. Credit for Telephone Service (CTS)	1.90	2
422. Credit for Operators (CTO)	1.83	3
432. Credit for Dispatch Circuits (CDC)	1.50	5
Total Credit:	5.23	10

If the score Amherst achieved for Receiving and Handling Fire Alarms was translated into a 100 point scale instead of the 10 points actually used, the relative Fire Suppression Rating Schedule classification for this section of the review would be a (relative) **Class 5**.

Fire Department

Fifty percent of a community's overall score is based upon the fire department's structure fire suppression system. ISO's field representative evaluated:

- Engine and ladder/service vehicles including reserve apparatus
- Equipment carried
- Distribution of fire companies
- Available and/or responding firefighters
- Automatic Aid with neighboring fire departments
- Training

Item 501 - Basic Fire Flow

The Basic Fire Flow for the community is determined by the review of the needed fire flows for selected buildings in the community. The following building addresses were used to determine the Basic Fire Flow:

- 5500 gpm 130 University Drive, Amherst
- 5500 gpm South Pleasant Street, Amherst
- 5000 gpm 70 South East Street, Amherst
- 4500 gpm 71 Strong Street, Amherst
- 4500 gpm 161 South Pleasant Street, Amherst

The fifth largest needed fire flow is determined to be the Basic Fire Flow. The maximum that the Basic Fire Flow can be is 3500 gpm. The Basic Fire Flow for Amherst has been determined to be 3500 gpm.

Item 513 - Credit for Engine Companies

The first item reviewed is Item 513 "Credit for Engine Companies". This item reviews the number of engine companies, their pump capacity, hose testing, pump testing and the equipment carried on the in-service pumpers. To be recognized, pumper apparatus must meet the general criteria of NFPA 1901, *Standard for Automotive Fire Apparatus* which include a minimum 250 gpm pump, an emergency warning system, a 300 gallon water tank and hose.

The review of the number of needed pumpers considers the Basic Fire Flow; the response distance to built-upon areas; the method of operation; and the response outside the city.

Item 501.A. Number of Needed Engine Companies (NE):

BASIC FIRE FLOW, GPM	ENGINE COMPANIES
500 - 1,000	1
1,250 - 2,500	2
3,000 - 3,500	3

For maximum credit, the FSRS indicates that 4 engine companies are needed in the fire district. This number is calculated as follows:

The greater of:

- 3 engine companies to support a Basic Fire Flow of 3500 gpm.
- 4 engine companies to provide fire suppression services to areas with a reasonable population of properties without a responding fire station within 1½ miles.
- 4 engine companies based upon the method of operation of the fire department.

The FSRS recognizes that there are 4 engine companies in service.

For maximum credit in the FSRS, at least two engine companies should respond for all reported first alarms for fires in buildings. The credit for engine companies has been reduced by 0.0 percent because the FSRS review deemed there is an adequate response to all reported fires in the district.

For each engine, ISO reviews the pump capacity as indicated by a pumper test, the hose (including hose testing) and the equipment carried.

For maximum credit in the schedule, pumper service tests must be done annually and documented. ISO evaluates the pumper service tests using NFPA 1911, *Standard for the Inspection, Maintenance, Testing and Retirement of In-service Automotive Fire Apparatus*. This Standard indicates that the service tests should be conducted for:

- 20 minutes @ 100% capacity at 150 psi
- 10 minutes @ 70% capacity at 200 psi
- 10 minutes @ 50% capacity at 250 psi

Other factors such as the "overload test" are not evaluated in the FSRS and are not required for FSRS credit.

For maximum credit in the schedule, hose tests must be performed annually and documented. ISO evaluates a hose testing program using NFPA 1962, *Standard for the Inspection, Care and Use of Fire Hose, Couplings and Nozzles and the Service Testing of Fire Hose*. Multiple jacket-lined hose manufactured prior to July, 1987 must be service tested at 250 psi. Relay supply hose that is 3½ inch to 5 inch should be tested at 200 psi and 5 inch to 6 inch relay supply hose should be tested at 150 psi. Hose that has been manufactured in July, 1987 and after should be tested to the service test pressure the manufacturer stenciled on the hose. All hose should be serviced tested for a minimum of 3 minutes.

The FSRS also reviews Automatic Aid. Automatic Aid is considered in the review as assistance dispatched automatically by contractual agreement between two communities or fire districts. That differs from mutual aid or assistance arranged case by case. ISO will recognize an Automatic Aid plan under the following conditions:

- It must be prearranged for first-alarm response according to a definite plan. It is preferable to have a written agreement, but ISO may recognize demonstrated performance.
- The aid must be dispatched to reported structure fires on the initial alarm.
- The aid must be provided 24 hours a day, 365 days a year.
- The aid must offset a need in the community ISO is surveying. For example, if a community needs a ladder company and the fire department does not have one, but a neighboring community's ladder company responds by Automatic Aid agreement, credit may be available.
- The aiding ladder company must cover at least 50% of the needed ladder company Standard Response District by hydrant count in the community being graded.

FSRS Item 512.D "Automatic Aid Engine Companies" responding on first alarm and meeting the needs of the city for basic fire flow and/or distribution of companies are factored based upon the value of the Automatic Aid plan (up to 0.90 can be used as the factor). The Automatic Aid factor is determined by a review of the Automatic Aid provider's communication facilities, how they receive alarms from your community, inter-department training with your fire department and the fire ground communications capability with your department.

For each engine company, the credited Pump Capacity (PC), the Hose Carried (HC), the Equipment Carried (EC) and a factor for an overweight apparatus all contribute to the calculation for the percent of credit the FSRS provides to that engine company.

After the Items in 512 are summed to determine the points received for the "In Service Total (EC)", the sum is divided by the total possible points (654 or 554) and then multiplied by the Needed Engine Companies (NE). Next, this is multiplied by the appropriate factor representing the percent of built-upon area of the city with first alarm response of one or two engine companies. Finally, this product is multiplied by the 10 points available for the "Credit for Engine Companies (CEC)" to determine the final score for this item.

The points calculated for Amherst for this item were:

CEC = 8.98 points

Item 523 - Credit for Reserve Pumpers

The second pumper item reviewed is Item 523 "Credit for Reserve Pumpers (CRP)". This item reviews the number and adequacy of the pumpers and their equipment with one (or more in larger communities) pumper out of service. The number of needed reserve pumpers is 1 for each 8 needed engine companies determined in Item 513, or any fraction thereof. The number of reserve pumpers credited in this item will not exceed the number of needed reserve pumpers. If only one reserve pumper is needed, and more than one reserve pumper is provided in the city, only the best equipped reserve pumper will be credited. Reserve pumpers are reviewed for pump capacity, hose carried, and equipment in the same manner as described in Item 512 except that Automatic Aid reserve pumpers are not considered.

The value of the Reserve Pumper Credit (RPC) is determined by multiplying the credited Pump Capacity (PC) times the credit for the Hose Carried (HC) times the credit for the Equipment Carried (EC) times the factor for an overweight apparatus.

After the items in 521 are factored to determine the points received for each reserve pumper, the reserve pumper with the largest points is selected for the Reserve Pumper Credit (RPC). The value for RPC is added to the value in Item 512 determined above. Next, the best equipped in-service pumper is subtracted from the in-service and reserve total. The difference is then divided by the total the possible points (654 or 554) times the Needed Engine Companies (NE). Finally, this quotient is multiplied by the 1 point available for the "Credit for Reserve Pumpers (CRP)".

These points calculated for Amherst resulted in the following:

CRP = 0.90 points

Item 530 – Credit for Pump Capacity

The next item reviewed is Item 532 "Credit for Pumper Capacity (CPC)". The total pump capacity available should be sufficient for the Basic Fire Flow of 3500 gpm in Amherst. The maximum needed pump capacity credited is the Basic Fire Flow of the community. The pump capacity is obtained by test at the rated pump pressure. Credit is limited to 80 percent of rated capacity if no test data is available within two years of the survey date. Less than 80 percent may be credited if other mechanical features of the apparatus indicate a generally poor mechanical condition.

The existing pump capacity (EP) represents the capacity of in-service pumpers, pumper-ladder, and pumper-service trucks that were credited in Item 513.

The reserve pump capacity (RP) is that capacity of reserve pumpers, reserve pumper-ladder, and pumper-service trucks that were credited in Item 523. One-half the capacity of permanently-mounted pumps capable of delivering at least 50 gpm at 150 psi on other apparatus, reserve pumpers and reserve pumper-ladder and reserve pumper-service trucks not credited in Items 513 or 523 is credited in this item. This capacity is expressed as "OP".

Automatic Aid pumper capacity is that capacity of pumpers credited as Automatic Aid in Item 513. The capacity credited does not exceed the percent determined by the value of the Automatic Aid plan determined in Item 512.D multiplies by the creditable pump capacity for each Automatic Aid pumper. This capacity is expressed as AAP.

The sum of the capacities determined for EP, RP, OP, and AAP above is 7500 gpm. The FSRs limits the total capacity to the Basic Fire Flow of 3500 gpm. Next, this capacity is divided by the Basic Fire Flow. Finally, this factor is multiplied by the 5 points available for the "Credit for Pumper Capacity (CPC)". The points calculated for Amherst for this item were as follows:

CPC = 5.00 points

Item 549 – Credit for Ladder Service

ISO establishes a "Credit for Ladder Service (CLS)" (FSRS Item 549). This item reviews the number of response areas within the city with 5 buildings that are 3 or more stories or 35 feet or more in height, or with 5 buildings that have a Needed Fire Flow greater than 3500 gpm, or any combination of this criteria. The height of all buildings in the city, including those protected by automatic sprinklers, is considered when determining the number of needed ladder companies. When no individual response area alone needs a ladder company, at least one ladder company is needed if buildings in the city meet the above criteria.

Ladders, tools and equipment normally carried on ladder trucks are needed not only for ladder operations but also for forcible entry, ventilation, salvage, overhaul, lighting and utility control. When long ladders are not needed in a community due to low height of buildings, the other support services tools and equipment are still needed. The number and type of apparatus is dependent upon the height of buildings, needed fire flow and response distance.

Response areas not needing a ladder company should have a service company. A service company is an apparatus with some or all of the equipment identified in Table 544.A (see the following pages).

The number of ladder or service companies, the height of the aerial ladder, aerial ladder testing and the equipment carried on the in-service ladder trucks and service trucks is compared with the number of needed ladder trucks and service trucks and an FSRs equipment list (Table 544 A, B, and C). Ladder trucks must meet the general criteria of NFPA 1901, *Standard for Automotive Fire Apparatus* to be recognized.

The number of needed ladder-service trucks is dependent upon the number of buildings 3 stories or 35 feet or more in height, buildings with a Needed Fire Flow greater than 3500 gpm, the response distance to built-upon areas, the method of operation and the response outside the city.

For maximum credit in the Schedule, 2 ladder companies are needed in your district. This is calculated as follows:

The greater of:

- a) 2 ladder companies due to the number of buildings over 3500 gpm or 3 stories in height or the method of operation.

Plus

- b) 0 additional ladder companies because 10% or less of the responses outside of the district result in a reduction of the ladder companies left in the district to 50% or less of the normal strength level.

We have recognized 2 ladder companies.

For maximum credit in the Schedule, a ladder or service company should respond on first alarms to all reported fires in buildings. It was determined the ladder or service company response is to 100% of first alarm fires in buildings.

For maximum credit in the Schedule, 0 service companies are needed in your district. This need is calculated as follows:

0 service companies due to the lack of 5 or more buildings in response areas with a needed fire flow of over 3,500 gpm or 3 stories in height; or due to the method of operation.

We have recognized 0 service companies.

Tests and sample forms for recording tests for aerial ladder and elevating platforms are described in NFPA 1911, *Standard for the Inspection, Maintenance, Testing and Retirement of In-service Automotive Fire Apparatus*.

If a ladder company is needed, the available equipment items in Table 544.A are summed to determine the points received for a Service Company, and available equipment items in Table 544.B are summed to determine the additional equipment points available for a Ladder Company. Table 544.A and 544.B points are added together to determine the total possible points available out of a possible 784 points.

If a service company is needed, the available equipment items are summed in Table 544.A. If additional ground ladders are needed for the service company, the assigned points for each available ground ladder up to 4 (from Table 544.B) are added to the points determined in Table 544.A.

All ladder company equipment, available service company equipment, available engine-ladder company equipment and available engine-service company equipment are summed. This sum is then divided by the sum of 784 points multiplied by the Needed Ladder (NL) plus 334 points multiplied by the Needed Service (NS) companies plus any points assigned for any additional ladders from Table 544.B.

Next, this factor is multiplied by the appropriate factor (A) representing the percent of built-upon area of the city with first alarm response of a ladder, service, engine-ladder or engine-service company to fires in buildings. Finally, this product is multiplied by the 5 points available for the "Credit for Ladder Service (CLS)". The points calculated for Amherst resulted in the following:

CLS = 3.10 points

Item 553 – Credit for Reserve Ladder and Service Trucks

The next item reviewed is Item 553 "Credit for Reserve Ladder and Service Trucks (CRLS)". This item considers the adequacy of ladder and service apparatus when one (or more in larger communities) of these apparatus are out of service. The number of needed reserve ladder and service trucks is 1 for each 8 needed ladder and service companies that were determined to be needed in Item 540, or any fraction thereof. When 8 or less ladder and service companies are needed, and 1 or more ladder companies are needed, the reserve truck should be a ladder truck. When the number of needed reserve ladder and service trucks exceeds the number of needed reserve ladder trucks, the difference is considered as needed reserve service trucks.

The number of in-service ladder and service trucks considered out of service is determined by the number of needed reserve ladder and service trucks. The in-service ladder and service trucks credited in Item 549 having the largest number of points is what is considered as out of service.

The equipment on credited reserve ladder and service trucks shall be reviewed by application of Tables 544.A, 544.B and 544.C.

The number of reserve ladder trucks credited in this item shall not exceed the number of needed reserve ladder and service trucks. If only one reserve ladder is needed, and if more than one reserve ladder or service truck is provided in the city, only the best equipped reserve ladder or service truck will be credited.

All ladder company equipment, available service company equipment, available engine-ladder company equipment and available engine-service company equipment are summed.

After the points for all reserve ladder and service equipment is determined, the reserve ladder service truck with the largest points is selected. This value is added to the value of all in-service ladder and service company equipment determined in Item 549. Next, the best equipped in-service ladder or service truck is subtracted from the in-service and reserve total. The difference is then divided by the total possible points for a ladder truck (784) times the Needed Ladder (NL) plus the total possible points (334) times the Needed Service (NS) plus any assigned points for any additional ladders needed from Table 544.B. Finally, this quotient is multiplied by the 1 point available for the "Credit for Reserve Ladder and Service Trucks (CRLS)".

The credit for Reserve Ladder and Service Trucks was calculated for Amherst as follows:

CRLS = 0.17 points

Item 561 – Credit for Distribution

Next, Item 561 "Credit for Distribution (CD)" is reviewed. This Item examines the number and adequacy of existing engine and ladder-service companies to cover built-upon areas of the city. The built-upon area of the city should have a first-due engine company within 1½ miles and a ladder-service company within 2½ miles.

To determine the Credit for Distribution, we begin by selecting certain values that have already been determined in the evaluation process. Existing Engine Company (EC) points and the Existing Engine Companies (EE) determined in Item 513 are considered along with Ladder Company Equipment (LCE) points, Service Company Equipment (SCE) points, Engine-Ladder Company Equipment (ELCE) points, and Engine-Service Company Equipment (ESCE) points determined in Item 549.

A company distribution study is conducted using a base map of the city drawn to scale. All named and numbered streets are depicted as well as all fire hydrant locations. The in-service engine company and in-service ladder and service company locations are plotted on the map. Using the prevailing map scale a 1½ mile polygon is drawn around each in-service engine company location and a 2½ mile polygon is drawn around each in-service ladder and service company location. Since the fire hydrant locations are indicative of growth and development they are used as a surrogate to quantify built-upon areas. All fire hydrants located within 1½ mile polygons are counted and summed.

This number is divided by the total number of fire hydrants in the city and multiplied by 100 to determine the percent of built-upon area within 1½ miles of an existing engine company. Similarly, all fire hydrants located within 2½ mile polygons are counted and summed. This number is divided by the total number of fire hydrants in the city and multiplied by 100 to determine the percent of built-upon area within 2½ miles of existing ladder and service companies.

The points calculated for Credit for Distribution for Amherst resulted in the following:

CD = 1.54 points

Item 571 – Credit for Company Personnel

Item 571 “Credit for Company Personnel (CCP)” reviews the average number of existing fire fighter and company officer personnel available to respond to reported “first alarm structure fires” in the city.

For on-duty strength, the total number of members on duty with companies is taken as the yearly average considering vacations, sick leave, holidays, “Kelley” days and other absences. When your fire department operates under a “minimum staffing” policy and sufficient funds are allocated in the fire department budget to hire back personnel from the off-shift to maintain the minimum staffing, ISO will use the minimum staffing in lieu of figuring an average.

Members on apparatus not credited under Items 513 and 549 that regularly respond to reported first alarms to aid engine, ladder and service companies are included in this item as increasing the total company strength.

Personnel staffing ambulances or other units serving the general public are credited if they participate in fire-fighting operations, the number depending upon the extent to which they are available and are used for response to first alarms of fire.

Call and volunteer members (VM) are credited on the basis of the average number staffing apparatus on first alarms. Off-shift paid members responding on first alarms are considered on the same basis as call and volunteer members. For personnel not normally at the fire station, the value of responding members is divided by 3 to reflect the time needed to assemble at the fire scene and the fractured ability to act as a team due to the various arrival times at the fire location when compared to the personnel on duty at the fire station during the receipt of an alarm. While Public Safety Officers do not represent the ability to respond from a single location as a team, they are positioned in emergency vehicles within the jurisdiction boundaries. In recognition of this increased response capability the value of responding members is divided by 2.

Call and volunteer members sleeping at fire stations are considered as on-duty members for the proportional time that they at the fire station.

The average number of personnel responding with those companies credited as Automatic Aid under Items 513 and 549 are considered for either on-duty or volunteer personnel as is appropriate. The actual number is calculated as the average number of personnel responding multiplied by the value of AA Plan determined in Item 512.D.

The maximum credit for any response of on-duty and call members are 12 fire fighters, including company officers, for each existing engine and ladder company and 6 for each existing service company.

The FSRS recognizes an average of 7.96 on-duty personnel and 16.93 volunteers respond on first alarm to structure fires.

The points calculated for Credit for Personnel for Amherst resulted in the following:

CCP = 5.67 points

Item 581 – Credit for Training

The final item reviewed in the fire department section is Item 580 “Credit for Training (CT)”. This item evaluates training facilities and aids and the use made of them by the fire suppression force; company training at fire stations; classes for officers; driver and operator training; new driver and operator training; hazardous materials training; recruit training; the pre-fire planning inspection program; and the training and inspection records.

A maximum of 35% of the training evaluation is attributed to facilities, aids and use, 50% is attributed to specialized training and the final 15% is available for the pre-fire planning inspection program.

The following pages outline the points scored by Item for Training.

Item 580.A.1 "Facilities and Aids "	Earned Credit	Credit Available
<p>Drill Tower* For maximum credit, a 4 story drill tower should be used.</p> <p>0 points were credited as there is no drill tower available and used by the fire department.</p>	0.00	8
<p>Fire Building (including smoke room)* For maximum credit, there should be a fire resistive smoke room that is separated from the drill tower so that training may be conducted in the tower and in the smoke room.</p> <p>A fire building is not available or used for training.</p>	0.00	8
<p>Combustible Liquids Pit* For maximum credit, a 1500 square foot combustible liquid pit or equivalent video instructing effective fire suppression of Class B fires should be used.</p> <p>0 credit was provided as there is no combustible liquids pit or video instructing effective fire suppression of Class B fires available for use to train the fire department personnel.</p>	0.00	5
<p>Library and Training Manuals For maximum credit, a complete library of training manuals should be available in the department for the membership. The library and manuals should include: NFPA "Fire Protection Handbook", "The Fire Chief's Handbook" published by Fire Engineering, "Managing Fire and Rescue Services" published by ICMA, Training manuals published by IFSTA or equivalent, and the following NFPA Standards, 472, 1001, 1002, 1021, 1201, 1401, 1403, 1410, 1451, and 1620.</p>	2.00	2
<p>Multi-Media Training Aids including Pump and Hydrant Cutaways A slide/overhead projector and compatible multi-media aids are available. A movie/VCR type projector and compatible multi-media aids are available. A pump cutaway is not available in the department for the membership. A hydrant cutaway is not available in the department for the membership.</p>	1.00	2

Item 580.A.1 "Facilities and Aids " (continued)	Earned Credit	Credit Available
Training Area* For maximum credit, a fire department training area of at least 2.0 acres in size should be available for single and multi-company drills. A training area of 0 acres is provided. Training is conducted on streets or other areas.	10.00	10
Review of Facilities and Aids (FA) total:	13.00	35
Item 580.A.2 "Use "		
a. Half-day (3 hours) drills, 8 per year (0.05 each) For maximum credit, all members should participate in 8 half-day, single company drills. There were an average of 8.00 single company half-day drills.	0.40	0.40
b. Half-day (3 hours) multiple-company drills, 4 per year (0.10 each): For maximum credit, all members should participate in 4 half-day multiple company drills. There were an average of 4.00 multiple company drills.	0.40	0.40
c. Night drills (3 hours), 2 per year (0.10 each): For maximum credit, all members should participate in two 3-hour night drills per year. There were an average of 2.00 night drills.	0.20	0.20
Factor for "Use" subtotal -	1.00	
Average percentage participating in drills -	100%	
Factor for Use (FU):	1.00	1.0
Review of Facilities and Aids (FA) total:	13.00	35
"Facilities, Aids and Use" subtotal -	13.00	
Deduction for incomplete or missing records -	-1.30	

Note: A single company drill may receive credit under a and c; A multiple-company drill may receive credit under a, b, and c.

***Note:** If the Drill Tower, Fire Building, Combustible Liquids Pit or Training Area do not achieve at least 10 points, Credit will be given for the use of buildings, streets and open areas (other than formal training grounds), but not both.

After the items under Item "Facilities and Aids" are summed and the factor for "Use" is established, the credit for "Facilities, Aids and Use" is determined by multiplying the total possible points (35 points) by the factor for "Use" (up to 1.0) and subtracting any deductions for record keeping to determine the credit.

The points calculated for "Facilities, Aids and Use" for Amherst resulted in the following:
Facilities, Aids and Use = 11.70 points

Specialized Training	Earned Credit	Credit Available
<p>B. Company Training</p> <p>For maximum credit, each firefighter should receive 20 hours per month in structure fire related subjects as outlined in NFPA 1001.</p> <p>There was an average of 1.22 hours per month of company training received by company members and participation was 100% of those eligible to participate.</p> <p>0.15 points will be deducted for missing or incomplete records.</p>	1.53	25
<p>C. Classes for Officers</p> <p>For maximum credit, each officer should receive 2 days of leadership, management, supervisory, and incident management system training per year as outlined in NFPA 1021.</p> <p>There was an average of 2.00 days devoted to officer classes and participation is 55% of those eligible to participate.</p> <p>0.00 points will be deducted for missing or incomplete records.</p>	8.25	15
<p>D. Driver and Operator Training</p> <p>For maximum credit, each driver and operator should receive 4 half-day sessions of driver/operator training per year in accordance with NFPA 1002 and NFPA 1451.</p> <p>There was 1.00 half-day session received per year by drivers and operators and participation was 100% of those eligible to participate.</p> <p>0.00 points will be deducted for missing or incomplete records.</p>	0.50	2
<p>E. New Driver and Operator Training</p> <p>For maximum credit, each new driver and operator should receive 40 hours of driver/operator training per year in accordance with NFPA 1002 and NFPA 1451.</p> <p>There were 40.00 hours received per year by new drivers and operators and participation was 100% of those eligible to participate.</p> <p>0.20 points will be deducted for missing or incomplete records.</p>	2.00	2
<p>F. Training on Hazardous Materials</p> <p>For maximum credit, each firefighter should receive ½ day of training for incidents involving hazardous materials in accordance with NFPA 472.</p> <p>There was 1.00 day of training received per year and participation was 100% of those eligible to participate.</p> <p>0.00 points will be deducted for missing or incomplete records.</p>	1.00	1

Specialized Training (continued)	Earned Credit	Credit Available
<p>G. Recruit Training</p> <p>For maximum credit, each firefighter should receive 240 hours of structure fire related training in accordance with NFPA 1001 within the first year of employment or tenure.</p> <p>There were 151.23 hours received per year and participation was 100% of those eligible to participate.</p> <p>0.00 points will be deducted for missing or incomplete records.</p>	3.15	5
<p>H. Pre-Fire Planning Inspections</p> <p>For maximum credit, pre-fire planning inspections of each commercial, industrial, institutional, and other similar type building (all buildings except 1-4 family dwellings) should be made twice per year by company members. Records of inspections should include up-to date notes and sketches.</p> <p>There are 0.00% of the buildings inspected at a yearly frequency of 0.00. Participation is 0.00%.</p> <p>0.00 points will be deducted for missing or incomplete records.</p>	0.00	15

To determine your credit for Training, the points credited in Item 580.A through 580.H are summed.

For maximum credit, records should be kept of all training. NFPA 1401 outlines the appropriate manner in which to accomplish this. A deduction of up to 20 points (20% for each Item) is made for a lack of records. A deduction of 10% is made for incomplete records and 20% for no records for each sub item.

A total of **1.65** points is deducted to reflect a deficiency of record keeping for Amherst.

Finally, this sum is divided by 100 and then multiplied by the 9 points available for the "Credit for Training (CT)". These points calculated for Amherst resulted in the following:

CT = 2.52 points

The final step in determining the Credit for Fire Department is to add up the following eight components:

Item	Earned Credit	Credit Available
513. Credit for Engine Companies (CEC)	8.98	10
523. Credit for Reserve Pumpers (CRP)	0.90	1
532. Credit for Pumper Capacity (CPC)	5.00	5
549. Credit for Ladder Service (CLS)	3.10	5
553. Credit for Reserve Ladder and Service Trucks (CRLS)	0.17	1
561. Credit for Distribution (CD)	1.54	4
571. Credit for Company Personnel (CCP)	5.67	15
581. Credit for Training (CT)	2.52	9
Total Credit	27.88	50

If the score Amherst achieved for the fire department was translated into a 100-point scale instead of the 50-points actually used, the relative Fire Suppression Rating Schedule classification for this section of the review would be a (relative) **Class 5**.

Water Supply

Forty percent of a community's overall score is based on the adequacy of the water supply system. The ISO field representative evaluated:

- representative building locations in the city to determine the theoretical amount of water necessary for fire suppression purposes (needed fire flow up to 3,500 gpm)
- fire hydrants: size, type and installation to determine the capacity of the fire hydrants
- hydrants: inspection and condition to review the fire hydrant inspection frequency, the completeness of the inspections and the condition of the hydrants

Item 616 – Credit for Supply System

The first item reviewed was Item 616 "Credit for Supply System (CSS)". This item reviews the rate of flow that can be credited at each of the needed fire flow tests locations considering the supply works capacity, the main capacity and the hydrant distribution. The lowest flow rate of these items is credited for each representative location reviewed. A water system capable of delivering 250 gpm or more for a period of two hours plus consumption at the maximum daily rate at the fire location is considered minimum in the ISO review.

To determine the score for Item 616 "Credit for Supply System", three sub items (Item 612 "Supply Works Capacity", Item 613 "Main Capacity" and Item 614 "Hydrant Distribution") need to be evaluated.

We calculate the supply works capacity for each representative needed fire flow test location. In doing this, ISO considers a variety of water supply sources. These would include public water supplies, emergency supplies (usually accessed from neighboring water systems), suction supplies (usually evidenced by dry hydrant installations near a river, lake or other body of water), and a supply developed by a fire department using large diameter hose or vehicles to shuttle water from a source of supply to a fire site. The result is expressed in gallons per minute (gpm).

The normal ability of the distribution system to deliver Needed Fire Flows (NFF) at the selected building locations is reviewed. The results of a flow test at a representative test location will indicate the ability of the water mains (or fire department in the case of fire department supplies) to carry water to that location.

The hydrant distribution is reviewed within 1,000 feet of representative test locations measured as hose can be laid by apparatus. Credit is allowed up to 1,000 gpm from each hydrant within 300 feet of the location, 670 gpm from hydrants within 301 to 600 feet of the location and 250 gpm from hydrants within 601 to 1,000 feet of the location. The normal distribution of hydrants in the vicinity of test locations considered in Items 612 and 613 are evaluated. These hydrant distribution allowances are based upon a standard fire hydrant with a pumper outlet conforming to the American Water Works Association (AWWA) Standard C-502 or C-503. In addition, they are based upon a standard complement of 1,200 feet of 2½ inch fire hose. If a hose diameter greater than 2½ inch is carried by all in-service pumpers, the hydrant distribution credit may be greater than that stated above due to the reduced friction loss in the larger diameter hose.

Where there are 2 or more systems or services distributing water at the same location, credit is given on the basis of the joint protection provided by all systems and services available.

- A. Sub-standard type hydrants with at least one fire department outlet are considered if they are capable of delivering at least 250 gpm.
- B. A cistern or other suction point must be capable of supplying 250 gpm for at least 2 hours to be recognized.
- C. The maximum credit for a hydrant may be limited by A or B above and is limited by the number and size of outlets as follows:

MAXIMUM CREDIT	
At least one pumper outlet	1,000 gpm
Two or more hose outlets, no pumper outlet	750 gpm
One hose outlet only	500 gpm

For maximum credit in the FSRS, the needed fire flows should be available at each location in the district. Needed fire flows of 2,500 gpm or less should be available for 2 hours; and needed fire flows of 3,000 and 3,500 gpm should be obtainable for 3 hours.

A variety of buildings were used as representative building locations in the city to determine the theoretical amount of water necessary for fire suppression purposes (needed fire flow).

The points calculated for Amherst resulted in the following:

CSS = 33.15

Item 621 – Credit for Hydrants

The second item reviewed is Item 621 “Credit for Hydrants (CH)”. This item reviews the number of fire hydrants of each type compared with the total number of hydrants.

For maximum credit in the FSRs, all hydrants should have a pumper outlet, 6 inch or larger branch connection, uniform size operating nut and should operate in a uniform direction in accordance with AWWA C-502 *Standard for Dry-Barrel Fire Hydrants* or AWWA C-503 *Standard for Wet-Barrel Fire Hydrants*.

For maximum credit, all suction supply points should be equipped with a dry hydrant with a 6 inch or larger pipe and fittings, a minimum number of 90 degree elbows (preferably no more than two), and suction screen placement so that the dry hydrant will deliver the design capacity (usually 1,000 gpm) as specified in NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*.

There are a total of 1119 hydrants in the city.

620. Hydrants, - Size, Type and Installation	Earned Credit	Credit Available
A. With a 6 -inch or larger branch and a pumper outlet with or without 2½ -inch outlets There are 1089 hydrants that have a 6 -inch or larger branch and a pumper outlet.	97.32	100
B. With a 6 -inch or larger branch and no pumper outlet but two or more 2½ -inch outlets, or with a small foot valve, or with a small barrel There are 18 hydrants that have a 6 -inch or larger branch but no pumper outlet, or have a small foot valve or with a small barrel.	1.21	75
C. With only a 2½ -inch outlet There are 0 hydrants with only a 2½ -inch outlet.	0.00	25
D. With less than a 6 -inch branch There are 12 hydrants with less than a 6 -inch branch connection.	0.27	25
E. Flush Type There are 0 hydrants that are of the flush type.	0.00	25
F. Cistern or suction point There are 0 locations that are considered a cistern and/or a suction point.	0.00	25
Total	98.79	100

Note 1: 2 points are deducted for each 10 percent of the hydrants that are not operating in a uniform direction of the majority, or with an operating nut different from the majority.

Of the 1119 hydrants that were reviewed, 2% did not operate in the direction of the majority and 0% had a different size operating nut.

Note 2: 10 points are deducted if more than one type hose thread is used for pumper or hose outlets. Of the 1119 hydrants that were reviewed, none had a different hose thread than the majority. There were no points deducted for this item.

To determine your "Credit for Hydrants", the points credited in Item 620.A through 680.F are summed. A deduction of 2 points is made for each 10% of hydrants not operating in a uniform direction of the majority, or with an operating nut different from the majority. A deduction of 10 points is also made if more than one thread is used for pumper or hose outlets. The sum is divided by 100 and then multiplied by the 2 points available for the "Credit for Hydrants (CH)". The points calculated for Amherst resulted in the following:

$$CH = 1.96$$

Item 630 – Credit for Inspection and Condition

The third item reviewed is Item 630 "Credit for Inspection and Condition (CIC)". This item reviews the fire hydrant inspection frequency, the completeness of the inspections and the condition of hydrants. Inspection and condition of hydrants should be in accordance with AWWA M-17, *Installation, Field Testing and Maintenance of Fire Hydrants*.

A. Inspection (HI):

The frequency of inspection is the average time interval between the 3 most recent inspections.

Frequency of Inspections	Points
½ year	100
1 year	80
2 years	65
3 years	55
4 years	45
5 years or more	40

Note 1: The points for inspection frequency are reduced by 10 points if the inspections are incomplete or does not include a flushing program. An additional reduction of 10 points are made if hydrants are not subjected to full system pressure during inspections. If the inspection of cisterns or suction points does not include actual drafting with a pumper, or back-flushing for dry hydrants, 40 points are deducted.

B. Condition (HF):

A factor (HF) is determined from the following list of conditions according to the actual condition of hydrants examined compared with the total number examined during the survey:

Condition	Factor
Standard (no leaks, opens easily, conspicuous, well located for use by pumper)	1.0
Usable (with some defects and/or impediments to use)	0.5
Not Usable	0.0

For maximum credit in the Schedule, all hydrants should be inspected twice a year. The inspection should include operation of the fire hydrant, a test for leaks (using domestic pressure), and a flushing of the hydrant. Records should be kept of inspections.

Water System: Amherst DPW Water Resources

Item 630.A "Inspection (HI):"		Time Interval
Most recent inspection was Mar 01, 2008		
1 st prior inspection was Mar 01, 2007		1 year
2 nd prior inspection was Mar 01, 2006		1 year
Review of Inspection (HI):	Earned Credit	Credit Available
	40	100

For maximum credit in the Schedule, all hydrants should be conspicuous, well located for use by a pumper and in good condition. There were 34 hydrants examined in this FSRS item.

Item 630.B "Condition (HF):"		Maximum Factor
Standard: There were 29 hydrants considered in standard condition.		1.0
Usable: There were 3 hydrants considered in usable condition.		0.5
Not Usable: There were 2 hydrants considered not usable.		0.0
Review of Condition (HF):	Earned Credit	Credit Available
	0.90	1.0

The points calculated for the inspection and condition of hydrants for Amherst resulted in the following:

CIC = 1.08

The final step in determining the credit for Water Supply is to add up the following three components:

Item	Earned Credit	Credit Available
616. Credit for Supply System (CSS)	33.15	35
621. Credit for Hydrants (CH)	1.96	2
631. Credit for Inspection and Condition (CIC)	1.08	3
Total Credit	36.19	40

If the score Amherst achieved for the water supply system was translated into a 100 point scale instead of the 40 points actually used, the relative Fire Suppression Rating Schedule classification for this section of the review would be a (relative) **Class 1**.

Divergence

Divergence considers a difference between the protection provided by the Fire Department and the Water Supply. This difference would prevent the better feature from being utilized to its fullest extent. Therefore, an adjustment is made to reflect any difference between these two features. Because of the difference in total weights assigned to the two features, the total for the Fire Department, which has the higher total weight, is adjusted to make the comparison reflect the relative adequacies of the two features.

The expression $[(CWS) - 0.8(CFD)]$ in the following formula is the Divergence calculation:

$$PPC = \frac{[(CFA + CFD + CWS) - 0.5 \{ [(CWS) - 0.8 (CFD)] \}]}{10}$$

$$PPC = \frac{[(5.23 + 27.88 + 36.19) - 0.5 \{ [(36.19) - 0.8 (27.88)] \}]}{10}$$

Summary of Public Protection Classification Review

Completed by ISO on May 07, 2009

for

Amherst

FSRS Item	Earned Credit	Credit Available
Receiving and Handling Fire Alarms		
414. Credit for Telephone Service	1.90	2
422. Credit for Operators	1.83	3
432. Credit for Dispatch Circuits	1.50	5
440. Credit for Receiving and Handling Fire Alarms	5.23	10
Fire Department		
513. Credit for Engine Companies	8.98	10
523. Credit for Reserve Pumpers	0.90	1
532. Credit for Pumper Capacity	5.00	5
549. Credit for Ladder Service	3.10	5
553. Credit for Reserve Ladder and Service Trucks	0.17	1
561. Credit for Distribution	1.54	4
571. Credit for Company Personnel	5.67	15
580. Credit for Training	2.52	9
590. Credit for Fire Department	27.88	50
Water Supply		
616. Credit for Supply System	33.15	35
621. Credit for Hydrants	1.96	2
631. Credit for Inspection and Condition	1.08	3
640. Credit for Water Supply	36.19	40
Divergence		
700: Divergence	-6.94	--
Total Credit	62.36	100.00

Community Classification = 4/9

If the individual scores Amherst achieved for receiving and handling fire alarms; fire department; and water supply were translated into a 100 point scale instead of the (10, 50 and 40) points actually used, the relative Fire Suppression Rating Schedule classification for each of these sections would be:

Receiving and Handling Fire Alarms: a (relative) **Class 5**

Fire Department: a (relative) **Class 5**

Water Supply: a (relative) **Class 1**

INSURANCE SERVICES OFFICE, INC.
HYDRANT FLOW DATA SUMMARY

City Amherst State Mass Witnessed by: Insurance Services Office, Inc. Date: April 29, 2009
County Hampshire

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM $Q=(29.83(C(d^2)^{0.5}))$			PRESSURE PSI		FLOW -AT 20 PSI		REMARKS***	
				INDIVIDUAL HYDRANTS	TOTAL	STATIC	RESID.	NEEDED **	AVAIL.			
1	Comm	Macintosh Drive North of Rambling Road	Amherst DPW Water Resources, Main	1970	0	0	1970	70	50	2250	3200	
2	Comm	College Drive (Hampshire) West of West Street	Amherst DPW Water Resources, Main	1430	0	0	1430	95	85	2250	4200	
3	Comm	East Hadley Road East of Riverglade Drive	Amherst DPW Water Resources, Main	3090	0	0	3090	140	115	4000	7200	(A)-(3350 gpm)
3A	Comm	East Hadley Road East of Riverglade Drive	Amherst DPW Water Resources, Main	3090	0	0	3090	140	115	3500	7200	
4	Comm	Station Road & South East Street	Amherst DPW Water Resources, Main	3130	0	0	3130	110	95	2000	8200	
5	Comm	South Pleasant Street & Hitchcock Road	Amherst DPW Water Resources, Main	2850	0	0	2850	90	70	5500	5600	
5A	Comm	South Pleasant Street & Hitchcock Road	Amherst DPW Water Resources, Main	2850	0	0	2850	90	70	2500	5600	
6	Comm	College Street & Seelye Street	Amherst DPW Water Resources, Main	2510	0	0	2510	80	65	4000	5300	
6A	Comm	College Street & Seelye Street	Amherst DPW Water Resources, Main	2510	0	0	2510	80	65	3000	5300	
7	Comm	High Street & Chestnut Street	Amherst DPW Water Resources, Main	2120	0	0	2120	75	60	4500	4300	
7A	Comm	High Street & Chestnut Street	Amherst DPW Water Resources, Main	2120	0	0	2120	75	60	3500	4300	
8	Comm	Village Park Road @ Unit 200	Amherst DPW Water Resources, Main	1500	0	0	1500	40	35	2250	3200	
9	Comm	University Drive 2nd hydrant North of Northampton Road	Amherst DPW Water Resources, Main	2020	0	0	2020	130	60	5500	2600	(A)-(2100 gpm)
9A	Comm	University Drive 2nd hydrant North of Northampton Road	Amherst DPW Water Resources, Main	2020	0	0	2020	130	60	2250	2600	
10	Comm	North Pleasant Street & Eastman Lane	Amherst DPW Water Resources, Main	1810	0	0	1810	95	45	4000	2300	
10A	Comm	North Pleasant Street & Eastman Lane	Amherst DPW Water Resources, Main	1810	0	0	1810	95	45	2250	2300	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE NOT INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

*** (A)-limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.

INSURANCE SERVICES OFFICE, INC.
HYDRANT FLOW DATA SUMMARY

City Amherst State Mass Witnessed by: Insurance Services Office, Inc. Date April 29, 2009
County Hampshire

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - CPM Q=(29.83(C(d ² p ^{0.5})))			PRESSURE PSI		FLOW -AT 20 PSI		REMARKS***	
				INDIVIDUAL HYDRANTS		TOTAL	STATIC	RESID.	NEEDED **	AVAIL.		
11	Comm	Sunderland Road & Montague Road	Amherst DPW Water Resources, Main	1120	0	0	1120	126	65	3500	1500	(A)-(2250 gpm)
12	Comm	Henry Street & Pine Street	Amherst DPW Water Resources, Main	1750	0	0	1750	65	40	1250	2400	
13	Comm	Belchertown Road & South East Street	Amherst DPW Water Resources, Main	3160	0	0	3160	125	110	5000	9000	(A)-(4800 gpm)
13A	Comm	Belchertown Road & South East Street	Amherst DPW Water Resources, Main	3160	0	0	3160	125	110	3500	9000	
14	Res	Hearthstone Road & Birchcroft Lane	Amherst DPW Water Resources, Main	1350	0	0	1350	90	30	750	1500	
15	Comm	Hall Drive West of Belchertown Rd	Amherst DPW Water Resources, Main	2670	0	0	2670	110	80	2250	4800	
16	Res	Bay Road & Mechanic Road	Amherst DPW Water Resources, Main	2210	0	0	2210	95	70	750	4000	

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